REMARKS

The Applicants request reconsideration of the rejection.

Claims 11-14 are pending, and were rejected under 35 U.S.C. §103(a) as being unpatentable over Figure 1 of Liwinski, U.S. 6,514,546 (Liwinski). The Applicants traverse as follows.

As filed, Claim 11 recited a high-frequency power amplifier circuit device including a first power transistor, a first capacitor, and a bias circuit including a first transistor and a first circuit. The first power transistor and the first transistor are arranged to form a current mirror circuit. Further, the first circuit of the bias circuit is arranged to receive a control signal and to provide the first transistor of the bias circuit with a current signal according to the controller signal.

Against these limitations, the Examiner, referring to Figure 1 of Liwinski, finds RF power transistor Q2 to correspond to the claimed first power transistor; capacitor C1 to correspond to the claimed first capacitor; and BIAS CIRCUIT to correspond to the claimed bias circuit. The Examiner

further finds that Liwinski's mirrored transistor Q1 corresponds to the claimed first transistor of the bias circuit, and transistor Q3 corresponds to the claimed first circuit.

According to Claim 11, the first circuit receives a control signal and provides to the first transistor of the bias circuit a current signal according to the control signal. The Examiner finds Liwinski's transistor Q3 as receiving a control signal V_{reg} and providing to the mirrored transistor Q1 a current signal I_{cm} according to the V_{reg}. Thus, the Examiner finds that Liwinski meets the limitation of Claim 11.

However, as stated in the Liwinski patent itself, the Figure 1 circuit has a structural problem which, because of the stacked transistors Q1, Q3, requires that the power supply voltage V_{reg} be substantially higher than twice the base-emitter voltage of the transistors Q1, Q3. See Column 2, lines 15-67. V_{reg}, of course, is the power supply voltage of a common cellular telephone incorporating the current mirror bias circuit shown in Liwinski's Figure 1. For the circuit to function from a 2.7V supply voltage (V_{reg}), it is necessary to reduce the size of resistor R1. Resistor R1 can be determined

from the supply voltage 2.7V minus the necessary bias voltage of 2.66V (0.04V). For a current I_{cm} of 1mA, resistor R1 must be 40 ohms. Thus, the size of resistor R1 when the power supply voltage is 2.7V (40 ohms) must be more than eight times smaller than the size of resistor R1 when the power supply voltage is 3.0V (340 ohms). As stated in the patent between lines 4 and 16 of Column 3, when the resistor is as small as 40 ohms, the gain in the feedback loop, which is proportional to the size of resistor R1, also is small, and as a practical matter insufficient to compensate adequately for variations in temperature and power supply voltage. Thus, as stated in lines 14-16, the performance of the bias circuit of Liwinski's Figure 1 is unacceptable if the power supply voltage is 2.7V.

As mentioned below, Liwinski states that the problem is centered on the use of the heterojunction bipolar transistor HBT for each of transistors Q1 and Q2. Noting a prior art solution to substitute a bipolar junction transistor BJT for one of the transistors in the bias circuit, Liwinski states that circuits including both HBTs and BJTs cannot be fabricated on a single integrated circuit. Therefore, Liwinski provides a different bias circuit in which the

transistors are preferably all HBTs, and in which the voltage at the collector of Q1 is fed back via a feedback circuit to control the voltage at the bases of transistor Q1 and the biased power transistor Q2. There is no disclosure or suggestion that Q3 provides a current signal to Q1 according to a control signal as claimed.

On other other hand, the invention as claimed in Claim 11 requires that the bias circuit include a first transistor and a first circuit, wherein the first circuit receives a control signal and provides to the first transistor a current signal according to the control signal. In the embodiment shown in Figure 3 of the application, the first transistor is represented (for example) at Q11, the control signal at Vapc, and the current signal at I11. Current signal I11 is provided from the first circuit, in contrast to current I_{cm} of Liwinski, which is provided **to both** transistors Q3 and Q1 from V_{reg} via resistor R1. Current I_{cm} is not provided to transistor Q1 from Q3.

The difference is important because the current signal I11 may change with given characteristics (such as the gate voltage-drain current characteristic of the first power

a higher output controllability and larger output power. See, for example, the discussion set forth on pages 5 and 6 of the present specification. More particularly, the first power transistor is driven with the current signal so as to make it possible to obtain a high frequency power amplifier circuit device with output characteristics that are not so sensitive to variations in the threshold voltage and other characteristics of the first power transistor. Advantageously, in a preferred embodiment of the invention, because the drain current of a field-effect transistor is proportional to the square of the gate voltage, the control signal can reduce the rate of change of the output in the vicinity of the threshold voltage of the field-effect transistor and increase the rate of change of the output in accordance with its own increase, thereby making it possible to achieve the higher output controllability and larger output power.

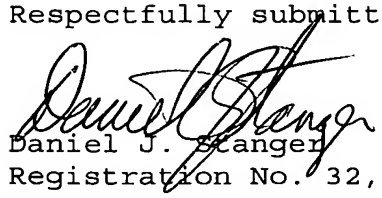
Dependent Claim 2 limits the first transistor of the bias circuit to be a field-effect transistor configured as a diode with the input terminal of the first transistor coupled to the first terminal of the first transistor, wherein the current signal is provided to the first terminal of the first

transistor. Figure 1 of Liwinski does not appear to suggest this construction of mirrored transistor Q1, despite the assertion on page 3 of the Office Action. Further, although the Examiner finds that field-effect transistor are "art-recognized equivalent transistors" to the bipolar transistors of Liwinski's Figure 1, the considerations discussed above suggest that the substitution is not an obvious one in the meaning of Section 103.

Claims 13 and 14 are respectively dependent from Claim 12, which is itself dependent from Claim 11. Thus, Claims 13 and 14 are patentable for the reasons set forth above, and have separate patentability in combination with the limitations of Claims 11 and 12.

In view of the foregoing amendments and remarks the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,



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